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a product or the position of the interface between two media or phases in a container, with a signal-generating unit, which generates high-frequency measuring signals, a coupling-in unit and a waveguide, the measuring signals being coupled in onto the waveguide via the coupling-in unit and conducted in the direction of the product via the waveguide, and with a receiving/evaluating unit, which determines the filling level of the product or the position of the interface in the container directly or indirectly via the delay time of the measuring signals reflected at the surface or interface of the product.

Background of the Invention

In the case of delay-time methods of determining the filling level using guided electromagnetic measuring signals, different types of waveguides are used. It has become known to use metal rods or tubes as waveguides. Because of their smooth surface, tubes or metal rods are distinguished by the advantages mentioned below:

- low attenuation of the high-frequency measuring signals;
- reduced tendency for the formation of deposits;
- low tensile forces in bulk materials;
- since there is in any case a small flexibility, the diameter of the rod can be chosen to be large without further restricting functionality. This leads to a further reduction in the attenuation of the high-frequency measuring signals, since the high-frequency surface currents can flow in an enlarged surface area.

Furthermore, the undesired influence of adhering product (absent echoes, attenuation of the--

Please substitute page 5 with the following:

--Taking the prior art as a starting point, the invention is based on the object of optimizing the waveguide.

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Summary of the Invention

The object is achieved according to a first embodiment by the waveguide being a wire cable which comprises a plurality of individual wires of a predetermined diameter, the individual wires being twisted together. The embodiment of the waveguide according to the invention is distinguished by high flexibility, whereby transport and simple installation are ensured. The comparatively large diameter of the individual wires has the effect that their abrasion resistance is very high. For example, cables of the 1x19 type are superior in this respect even to plastic-coated cables. Furthermore, because of the smooth surface of the individual wires, the tensile forces in solid materials are lower than in the case of the rough stranded wires previously used. In addition, the material cross section in the case of the solid individual wires is particularly great. This is reflected in a particularly high tensile load-bearing capacity. Since only the relatively thick individual wires of the outer layer come into contact with the product in the case of the apparatus according to the invention, the number of lossy contact points between the individual wires is very small. The measuring signals consequently only experience low attenuation.

According to an advantageous development of the apparatus according to the invention, the waveguide comprises a plurality of coaxial layers, the individual wires of each layer being twisted in the same direction. The individual layers are preferably twisted in opposite directions. Thus,

the waveguide is made up, for example, of 19 individual wires which are arranged in three layers.

R2 In the case of wire cables comprising, for example,--

Please substitute page 8 with the following:

B3 cont --least one predetermined region of the waveguide. This defect is preferably defined by a change in the geometry of the waveguide. For example, in the embodiment with a plurality of pieces of the waveguide flexibly connected by an intermediate piece, the reflection of the measuring signal at the transition point between the piece and the intermediate piece can be used as the reference mark. Reference marks are advisable because product adhering to the waveguide above the actual surface of the product generally leads to a lower propagation velocity of the surface wave, as a result of which too low a filling level is indicated if there is no correction by reference marks.

Brief Description of the Drawings

The invention is explained in more detail on the basis of the following drawings, in which:

Figure 1 shows a schematic representation of the apparatus according to the invention,

Figure 2 shows a side view of a waveguide which comprises twisted individual wires,

Figure 3 shows a preferred embodiment of a waveguide comprising a plurality of twisted individual wires in cross section and

Figure 4 shows a side view of a further embodiment of the waveguide according to the invention.

Description of the Preferred Embodiments

Figure 1 shows a schematic representation of the apparatus according to the invention. The